



What is nuclear fuel?

What does nuclear fuel look like?

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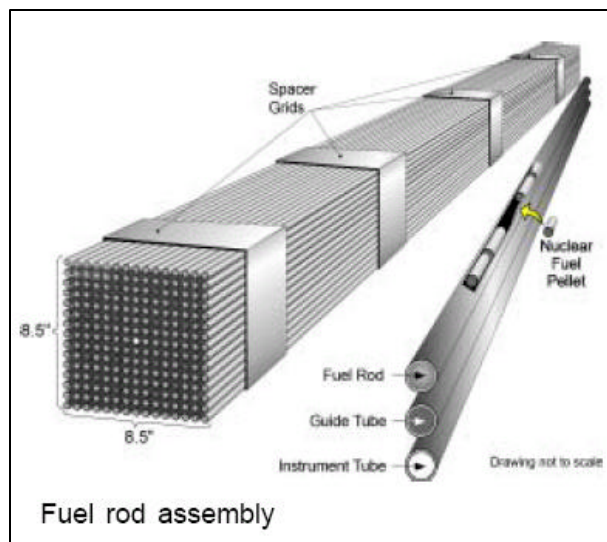
Nuclear fuel is a solid material like coal or wood. It is not a liquid or a gas like oil or propane. For U.S. nuclear power plants, uranium oxide fuel is made into pellets.



Nuclear fuel pellet

The pellets are stacked into long tubes, typically made of an alloy of zirconium metal, to form fuel rods.

The fuel rods are bundled together and structurally reinforced to form a fuel assembly. These assemblies are installed in a nuclear reactor. The size and form of a nuclear fuel assembly depends on the type of reactor in which it will be used. There are typically hundreds of fuel assemblies in a single nuclear power plant.



Fuel pellets → fuel rods → fuel assemblies

What is the composition of new Light Water Reactor nuclear fuel?

The amount of *isotope* uranium-235 compared to isotope uranium-238 determines how energetic nuclear fuel is. Natural uranium is not energetic enough to use as fuel in *light water reactors*; it cannot sustain fission reactions. Instead, such reactors need uranium with a higher fraction of uranium-235 than is found in nature. This higher fraction is called “enriched”. Light water reactors use fuel that is three to five percent uranium-235, whereas natural uranium is only 0.72 percent uranium-235.

What is the composition of used Light Water Reactor nuclear fuel?

Used fuel that comes out of a power plant is only partially consumed. It has three major components: *uranium*, *transuranic elements* and fission products.

- About 94% is uranium. It has lower energy content than the uranium in fresh fuel, too low to use directly as fresh fuel, because the fraction of uranium-235 has fallen too low.
- About 1% is transuranic elements, which are those elements, like plutonium, that are beyond uranium in the periodic table; they are high-energy byproducts of neutron absorption in uranium.
- Less than 5% are fission products that result from splitting uranium or transuranic elements.

The uranium and transuranic elements in used nuclear fuel still have a lot of residual energy. However, the used fuel must be removed from the nuclear power plant because of buildup of fission products that stop the self-sustaining fission reaction.